



# Sustainable land management

# Erosion in Northland

## What is erosion?

Erosion is the stripping away of soil and rock from landforms. The process creates sediment which is transported – usually by water and wind – down the slope from where it came.

Erosion is a natural process however people can speed up this process by removing vegetation from the land and poor land-use practices.

It is estimated that the increase in the rate of erosion is 16 times greater when land is covered in pasture as opposed to native forest!



*Northland Regional Council Land Management Specialist Bob Cathcart inspects the head of a large slip in the Ruakaka catchment in 2007.*

## What causes erosion?

There are a number of factors that can cause soil erosion. Gravity, water and wind are usually involved but these can also be influenced by the type of soil, climate, vegetative cover – trees versus pasture – topography and poor land-use practices. Most erosion happens only now and again, during storms and as a result of the associated flooding.



*This is what happens when a large amount of soil detaches from a hillside!*

## Why control erosion?

For landowners/farmers it is important to control and prevent erosion as it's about maintaining the amount of land available for production.

Soil erosion significantly lowers both short and long-term production and profitability. For example, with slip erosion production never fully recovers to its former extent and it is expected that the site will only regain 80 percent of its former production levels.

Erosion can also impact infrastructure – roads or farm tracks – preventing access, not to mention the cost of any associated repairs.

## What are the main erosion types?

There are three main types of erosion: surface, mass movement and fluvial. The following gives an outline of these types and the category of erosion within each.



*The effects of water and gravity.*

## Surface erosion

Surface erosion occurs when soil particles are detached from the surface and transported across the ground by water, wind or gravity.

Types of surface erosion include;

### Sheet erosion

Sheet erosion is the removal of soil particles overland. This happens when rain falls on bare or sparsely-covered soil, detaching soil particles that are then carried downhill in surface run-off.



*An example of sheet erosion that has developed into fluvial erosion.*

### **Wind erosion**

Wind erosion happens when wind removes fine, dry and loose soil particles. The airborne soil particles then move against the remaining soil, dislodging still more. This can lead to surface-creep causing sand dunes to advance and smother other areas.

### **Mass movement**

The most common form of erosion in the hill country is mass movement. This type of erosion usually happens after heavy rain or an earthquake. Hillsides slip, slump or landslide. Slopes steeper than 15 degrees are susceptible to mass movement and those steeper than 28 degrees or more have an extreme potential – in other words, the steeper the slope the more likely it is to slip.

Types of this form of erosion include;

#### **Slip erosion**

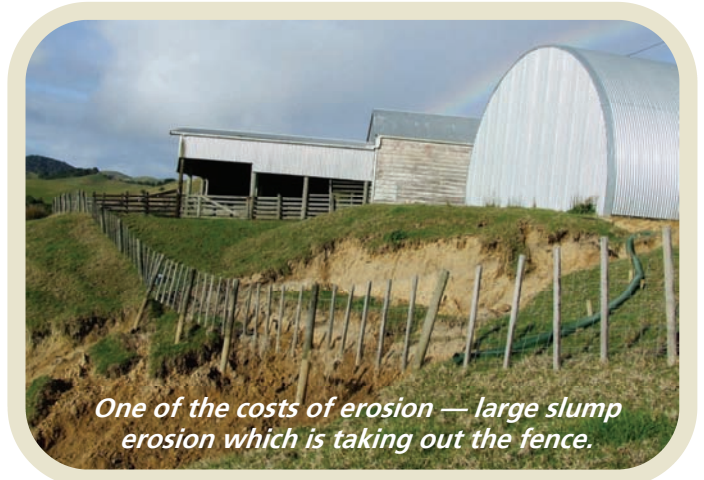
Slips usually happen on land where forest has been converted to pasture. Slips occur when the soil – topsoil and subsoil – on slopes becomes saturated. Unless the soil is held by roots to the underlying surface, it simply slides off downhill, exposing the underlying material.



*An example of mass movement erosion.*

### **Slumps**

Slumps consist of a number of blocks of soil and regolith – loose dust, soil and broken rock which forms a layer over solid rock – which move in an arc above a curved sheer surface in underlying rock. The moving mass is separated from the slope behind a high vertical rupture or headwall. The movement breaks into an uneven surface of many backward tilted segments. Water flows can be disrupted by slumps, causing the formation of wetlands or ponds.



*One of the costs of erosion — large slump erosion which is taking out the fence.*

### **Earthflows**

Flows consist of soil, under-lying material and rock which basically break away and creep very slowly down the hillside. Think of it as a slow-moving mass of liquid oozing downwards that retains its form and shape and takes trees and pasture along with it.

Flows are usually associated with mudstones, argillites and clay minerals which all come from sediment.



*Northland Regional Council Environmental Monitoring Officer Franco Meyer at the foot of a debris avalanche.*

### **Debris avalanches**

Debris avalanches are slips that contain a mix of water as well as logs, boulders and soil. A debris avalanche cuts a narrow path through surrounding forest and spills both into river systems and out onto surrounding land. Steep hill country is very susceptible to debris avalanches regardless of the health and extent of cover of native bush.

Debris avalanches are unpredictable and very destructive, posing a significant risk to human life.

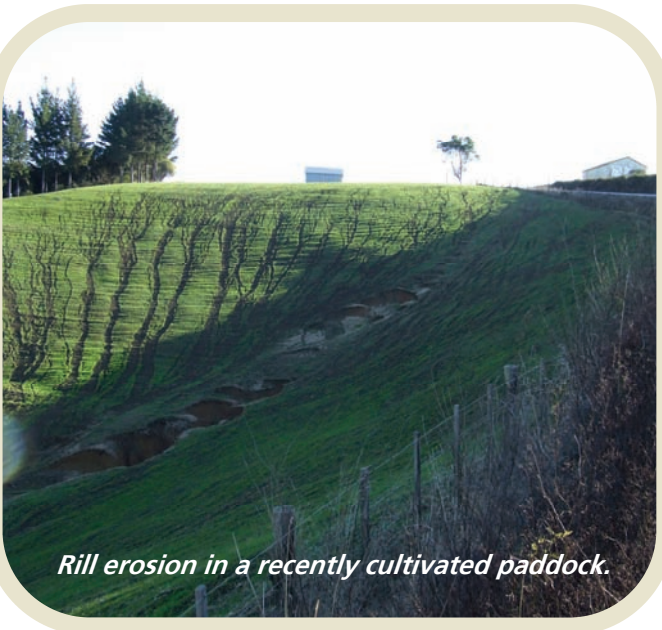
## Fluvial erosion

This occurs when the action of running water gouges shallow channels or deeper gullies into the soil. On sloping land the gullies can cut deep into the subsoil or undermine the surrounding soils. The sediment is washed into streams.

Types of this form of erosion include;

### *Rill erosion*

Rill erosion refers to the action of running water over a slope. It acts to gouge shallow v-shaped channels or rills in the soil. Rills can often develop into gullies.



*Rill erosion in a recently cultivated paddock.*

### *Gully erosion*

This type of fluvial erosion occurs when soil, base material or rock is removed by the action of flowing water which then forms narrow channels that are larger than rills. The depth at which a gully erodes depends on the type of subsoil – downward cutting will continue until the water meets greater resistance, like a hard rock layer. Gullies tend to erode at their head, eating back into the landscape.



*Gully erosion outlet of Lake Owhareiti.*

### *Tunnel gullies*

Tunnel gullies form when subsurface concentrations of water act to scour and form tunnels which, if left unchecked, eventually collapse. This type of erosion is a nuisance to farmers as stock are often lost down through the holes it forms.



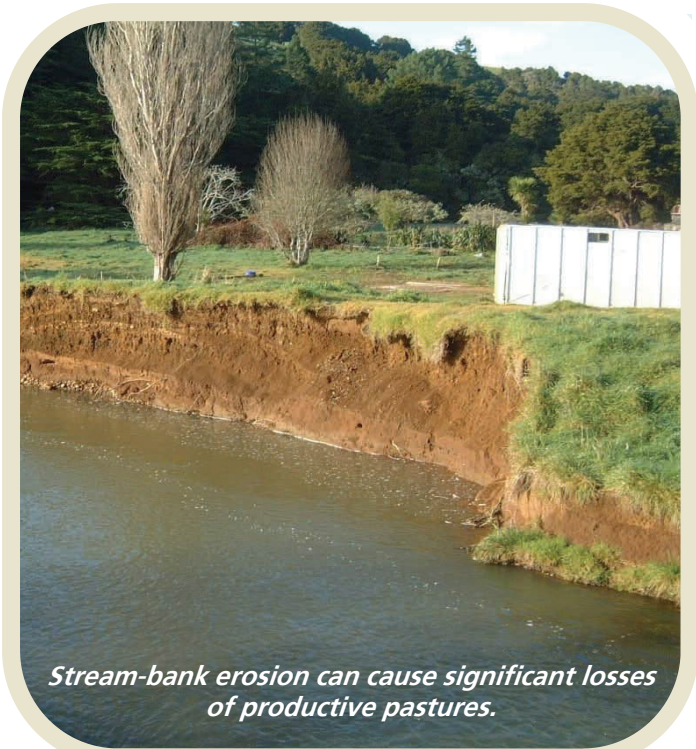
*Gully erosion.*

### *Stream-bank erosion*

This form of erosion happens when the river bed and bank scour out during a flood, which removes support therefore making the bank unstable and causing it to collapse.

Built-up gravel beds and blockages in the waterways can also influence stream-bank erosion. The water is directed by the gravel or blockage into the stream-banks causing them to erode.

Stream-bank erosion is significant as often valuable farm land is next to rivers and on alluvial fans – the erosion eats away productive pasture.



*Stream-bank erosion can cause significant losses of productive pastures.*

## Where does eroded sediment end up?

Eroded soils usually find their way into waterways. While soil is a natural substance, it's actually one of the most serious and common pollutants of our waterways. It can affect water quality, smothering creatures and shellfish and silt up estuaries and harbours, worsening flooding problems. Nutrients – for example, phosphate – and bacteria carried with the soil can also be damaging in large amounts.



*Sediment discolours a stream as it reaches the coast.*

## More information

More information about erosion control and pole planting plus demonstrations of specific techniques are available free from the Northland Regional Council.

The booklet *Growing Poplar and Willow Trees on Farms* is available online at: [www.maf.govt.nz](http://www.maf.govt.nz) Use the 'search MAF' option and type "growing poplar and willow trees".

The Northland Regional Council would like to thank the following statutory authorities for providing information used in the preparation of the Sustainable Land Management fact sheets:

- Environment Waikato
- Bay of Plenty Regional Council
- Hawkes Bay Regional Council
- Taranaki Regional Council
- Ministry of Agricultural and Fisheries (MAF)
- Ministry for the Environment (MfE).

## How can you help reduce erosion?

Erosion prevention is the best course of action – as the saying goes, prevention is better than cure.

Some common ways to reduce erosion include:

- Plant trees on hills and stream-banks, native or exotic;
- Fence gullies and waterways to prevent stock access;
- Remove wild goats, rabbits and possums - they eat the vegetation, reducing the forest health;
- Keep stock off steep pasture when it is wet;
- Minimise the use of earthworks and use appropriate practices;
- Plant cover crops when land is left fallow;
- Rip wheel tracks in cultivated land where runoff and erosion along these tracks are a problem; and
- Retire unproductive land and avoid cultivating steep land.

## Contacts

For further information and advice contact Northland Regional Council Land Management staff.

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